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Automatic, Nondestructive Test Monitors In-Process Weld Quality

A new instrument, which has been developed, automatically and nondestructively monitors the quality of welds produced in the process of micro-resistance welding of electronic assemblies. This instrument ensures 100 percent nondestructive inspection of the welds on every workpiece, as contrasted with conventional systems which involve either destructive or nondestructive tests on samples taken from the production line after the welding operation is completed.

The new instrument automatically measures the infrared energy generated in the weld as the weld is made on each workpiece and compares this energy with maximum and minimum limits of infrared energy values previously correlated with acceptable weld-strength tolerances. In the experimental correlations performed on more than 17,000 welds of several wire combinations, infrared energy less than a certain value resulted in inadequate weld tensile strength, whereas excessive infrared energy resulted in weld expulsion.

When the infrared energy measured by the instrument is below or above the preset limits, a red indicator light turns on, denoting an unacceptable weld. The instrument then locks out the welding system power supply, preventing further welding until the fault is determined. After the fault is determined and corrected, the inspector can reset the instrument with a key, and welding can resume. When the measured

infrared energy falls between the preset limits, a green indicator light turns on momentarily, denoting an acceptable weld.

Notes:

1. This instrument can, in principle, be modified to provide an in-process, closed-loop, weld-control system. This system would control the shape of the weld pulse to ensure optimum weld strength. The system would include a computer incorporating a generator of a predetermined infrared energy profile, a sensor of the infrared energy generated in the weld, and a welder whose output current would be controlled as a function of the difference between the infrared energy measured as the weld progresses and the standardized energy profile.
2. Complete details may be obtained from:
Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B68-10333

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: F. C. Deal
of Martin Marietta Corporation
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Category 01